

CALVAL in JAXA

Akihiko KUZE (JAXA EORC)

March, 2016
Canberra

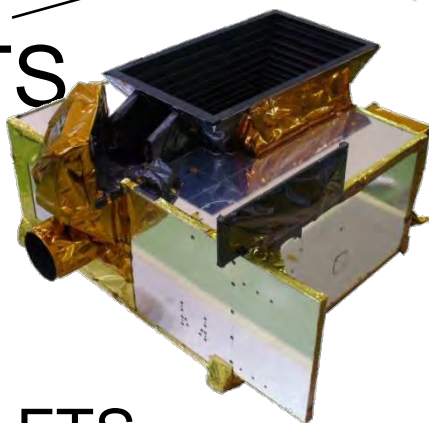
IBUKI Launch Date 12:54, January 23, 2009 (JST)



TANSO-on GOSAT (2009-)

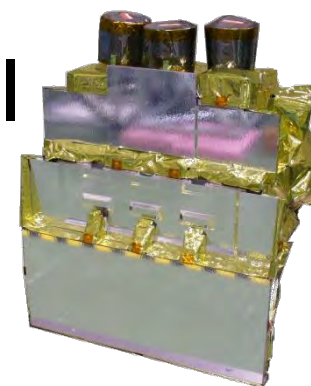
Thermal And Near
infrared Sensor for
carbon Observation

TANSO-FTS



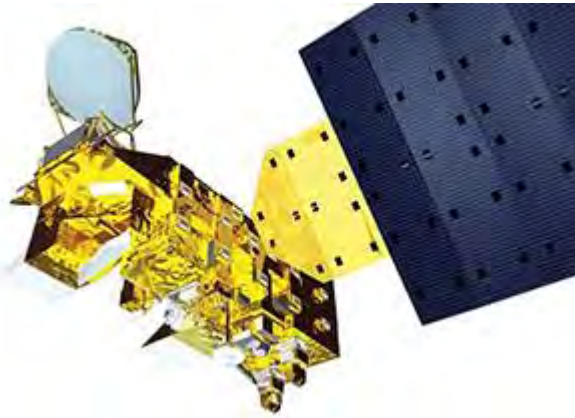
SWIR/TIR FTS

TANSO-CAI

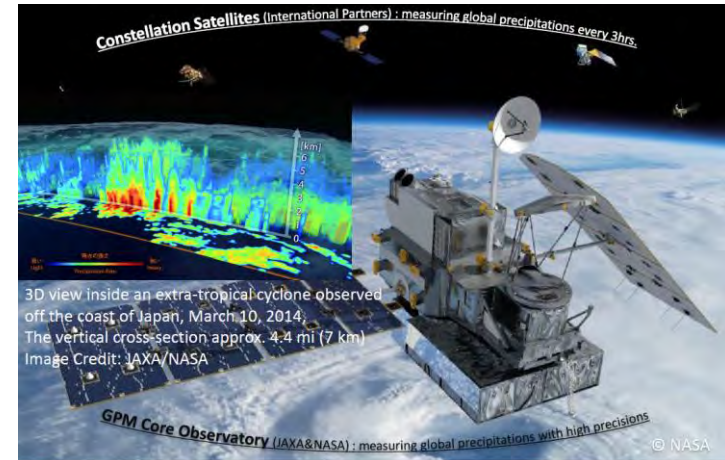


UV, Visible, SWIR Imager

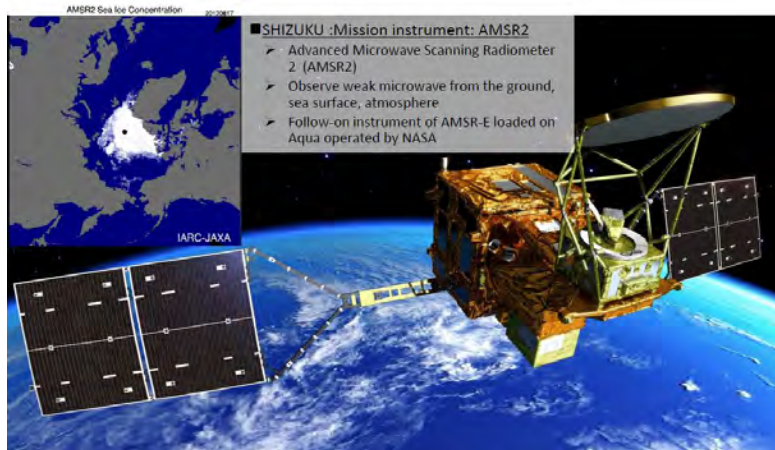
JAXA's earth observing instruments from space (non-optical)



AMSR-E on EOS Aqua (Completed in 2015)



DPR on GPM (2014-)



AMSR2 on GCOM-W (2012-)



ALOS-2 (2014-)

GOSAT





Launch and Orbit

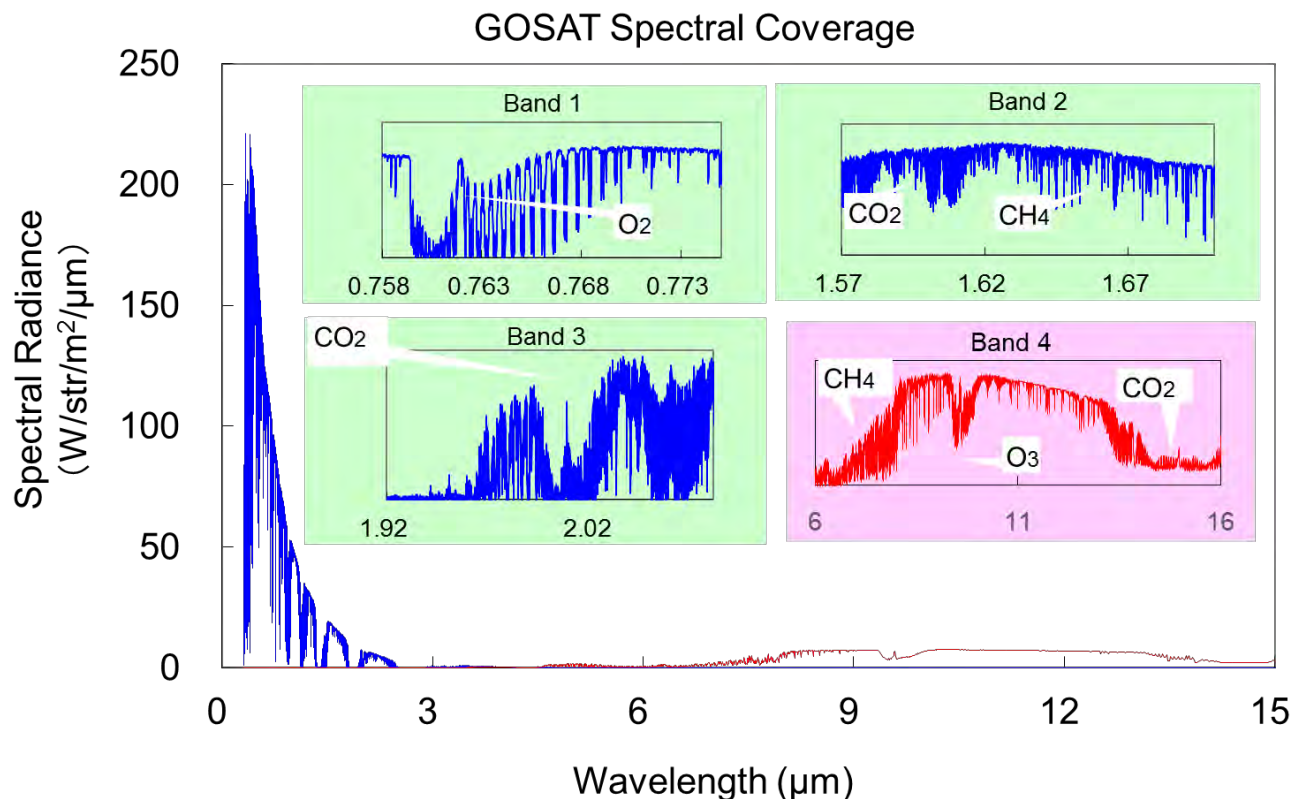


Size	Main body	3.7m(H) x1.8m(W) x 2.0m(D) (Except attachment)
	Wing Span	13.7 m
Mass	Total	1,750 kg
Power	Total	3.8KW(EOL)
Life Span	5 years	
Orbit	Sun Synchronous Orbit	
	Local time	13:00+/-0:15 (12:47 March 2009)
	Altitude	666 km
	Inclination	98 deg
	Re-visit	3 days
Launch	Vehicle	H-IIA
	Date	Jan. 23, 2009





Wide Spectral Coverage



- 3 narrow bands
 - 0.76 μm
 - 1.6 μm
 - 2.0 μm
- A wide band
 - 5.5 – 14.3 μm
- With 0.2cm^{-1} spectral resolution (interval)

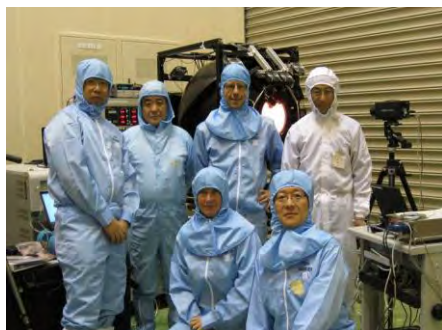
- Column averaged density of CO_2 is mainly retrieved by using the absorption lines between 1.6 μm region.
 - The intensities of these lines are less temperature dependent and not interfered by other molecules.
- O_2 A band absorption at 0.76 μm : Dry air column



- Radiometric Calibration
- Prelaunch and in-orbit



Prelaunch Radiometric Calibration X calibration with OCO in 2008



AIST/NMIJ
Standard

NIST Lamp
Standard

Portable standard radiometers
3 spectral bands (GOSAT)

0.76 micron
1.6 micron
2.0 micron

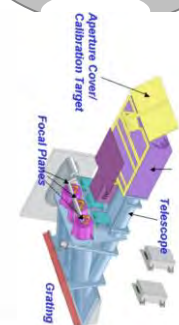
ABO2
WCO2
SCO2

3 Detectors (OCO)



OCO
Inner-
Illuminated
Integrating
Sphere

FieldSpec
Spectra
diometer



GOSAT Inner-
Illuminated Integrating
Sphere

Fixed-point
Blackbody
(GOSAT)

Double Grating
Monochromator

Dec, 2008@TKSC
Difference 1.59%, 1.1%, 1.4%

April 2008@JPL Difference
1.5%±0.6%, 2.7%±1.1%, 0.2%±4.1%



Calibration and Validation at RRV, Nevada



Path 37
from West



33.0deg



Horizontal
 CO_2 CH_4

Vertical
 CO_2 CH_4 O_3



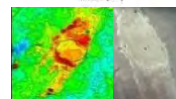
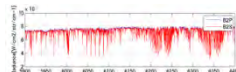
Aerosol Optical
Depth

Surface
 CO_2 CH_4 O_3

25deg

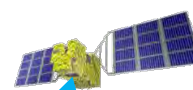


19deg



High altitude

19.9deg



Path 36
from East

TOA Spectral radiance



Surface Thermal
radiation



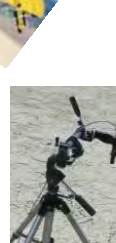
Surface and Profile
of Pressure,
Temperature, Humidity

Variability



BRDF

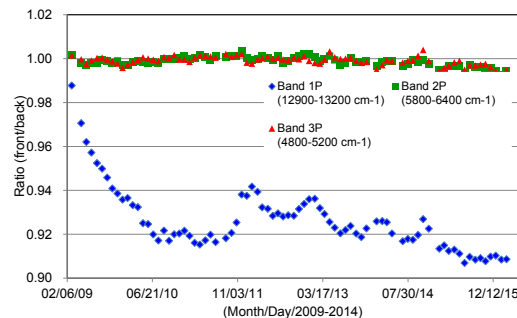
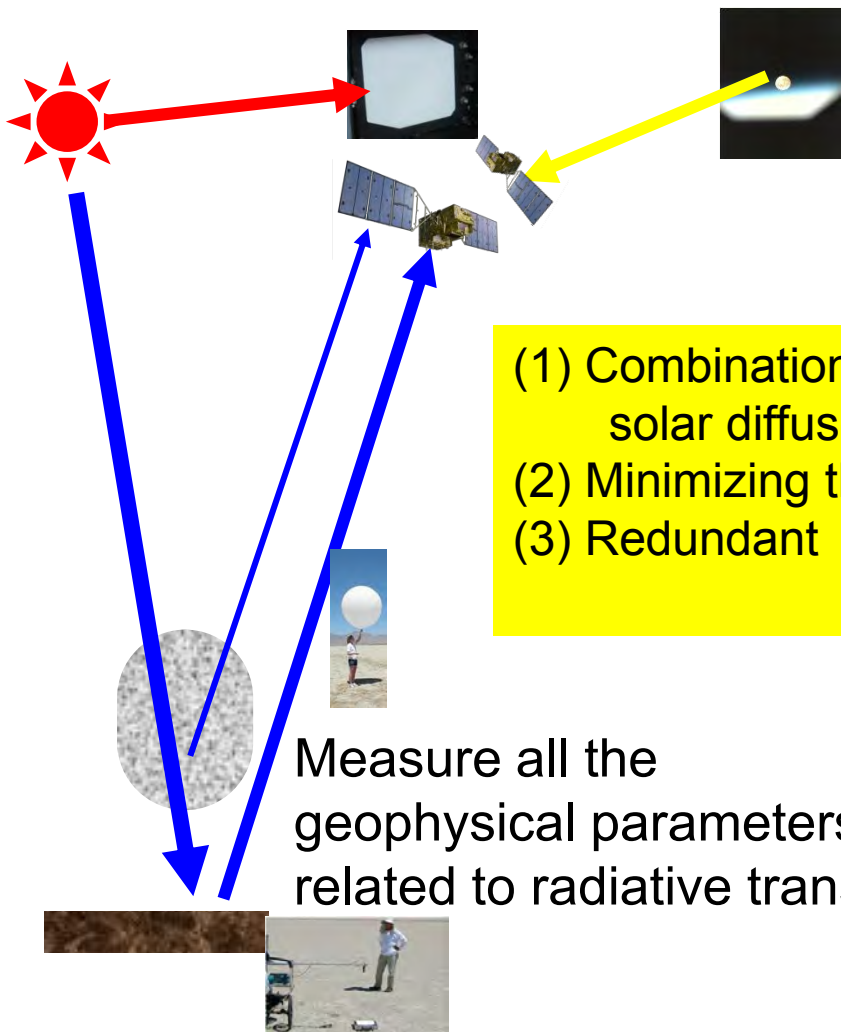
Surface Spectral
Reflectance



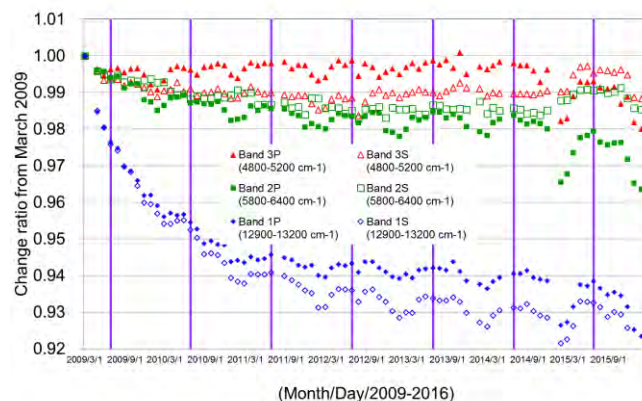
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GOSAT Calibration: long term stability

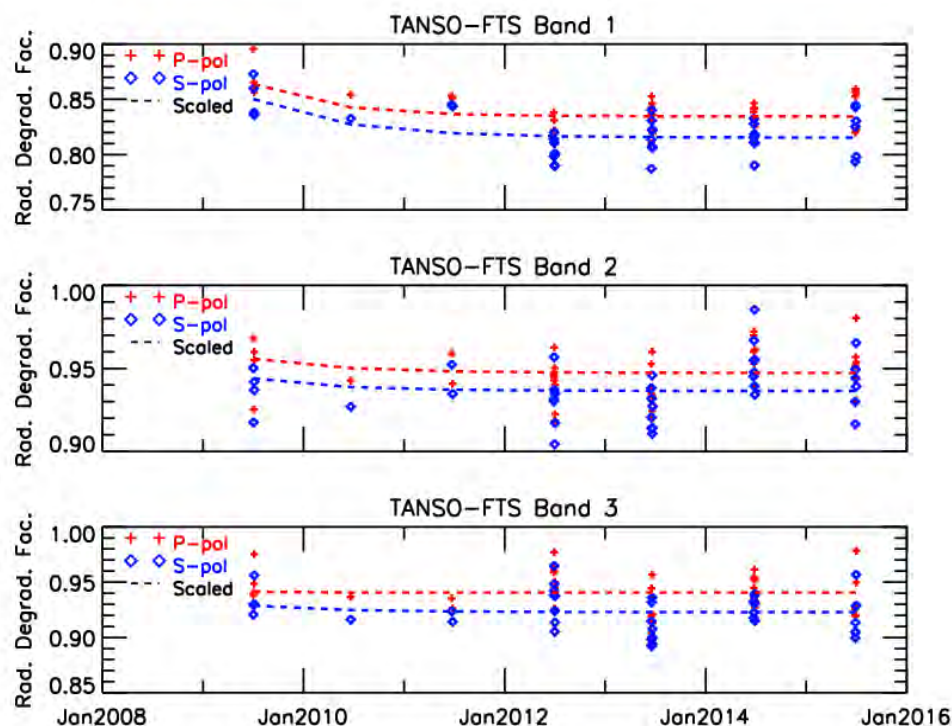


- (1) Combination of Vicarious calibration for absolute and **backside** solar diffuser for relative
- (2) Minimizing the exposure time of the calibration sources.
- (3) Redundant Sahara: unknown AOT
Lunar: Strong BRDF

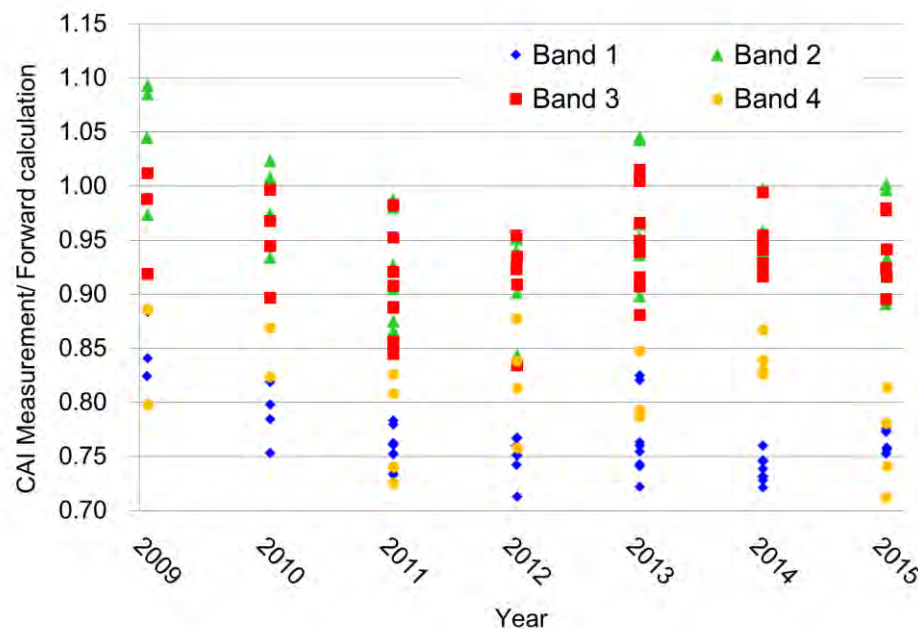




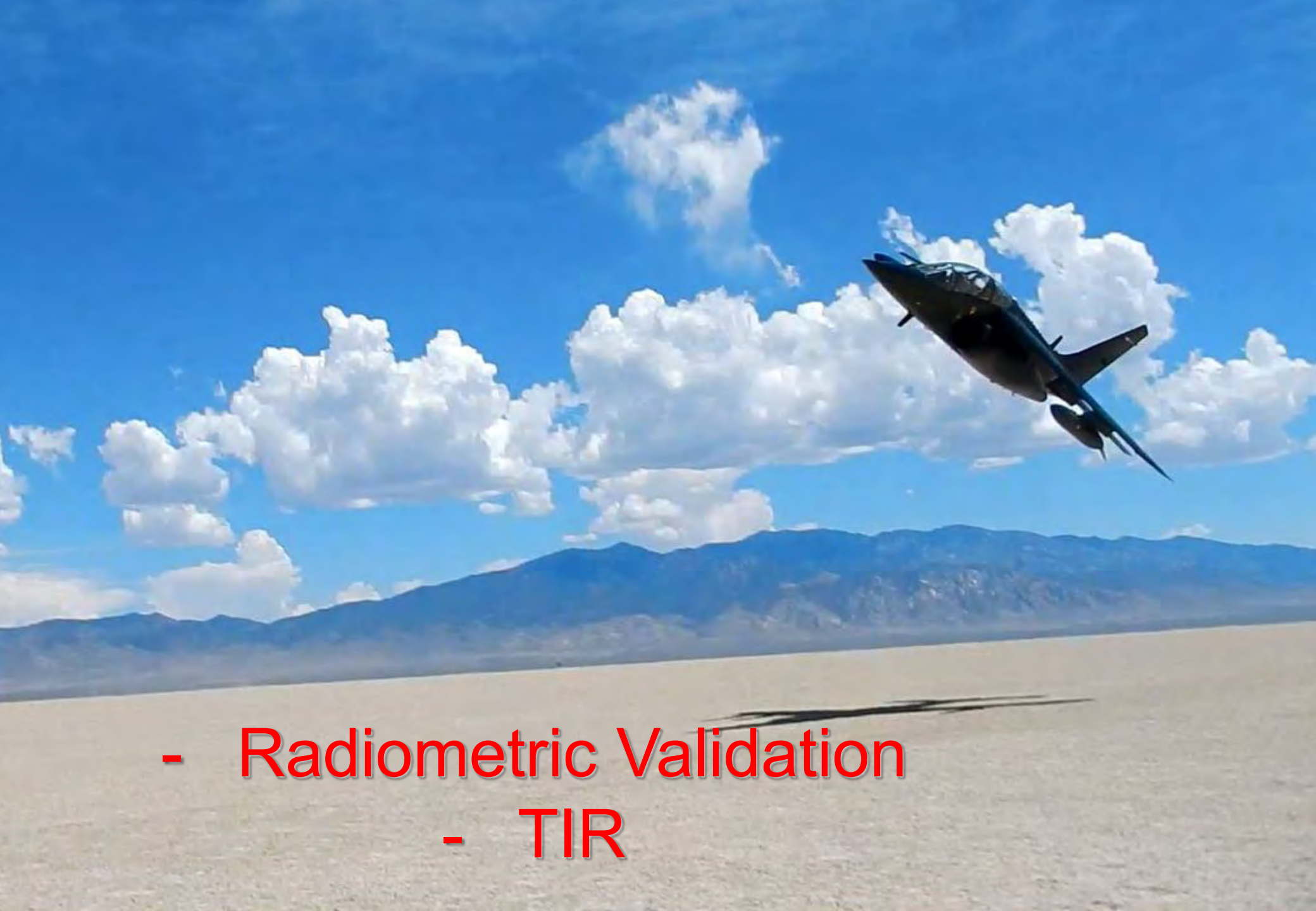
TANSO: Radiometric Degradation Factors using RRV (Nevada) campaign data



TANSO-FTS
(0.76, 1.6, 2.0 μm)



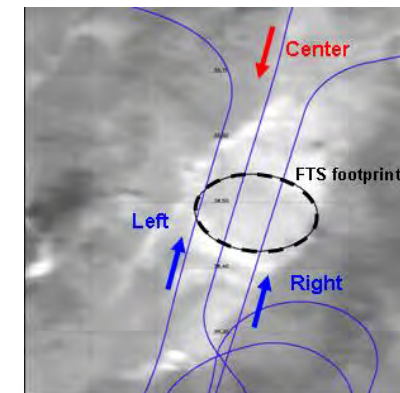
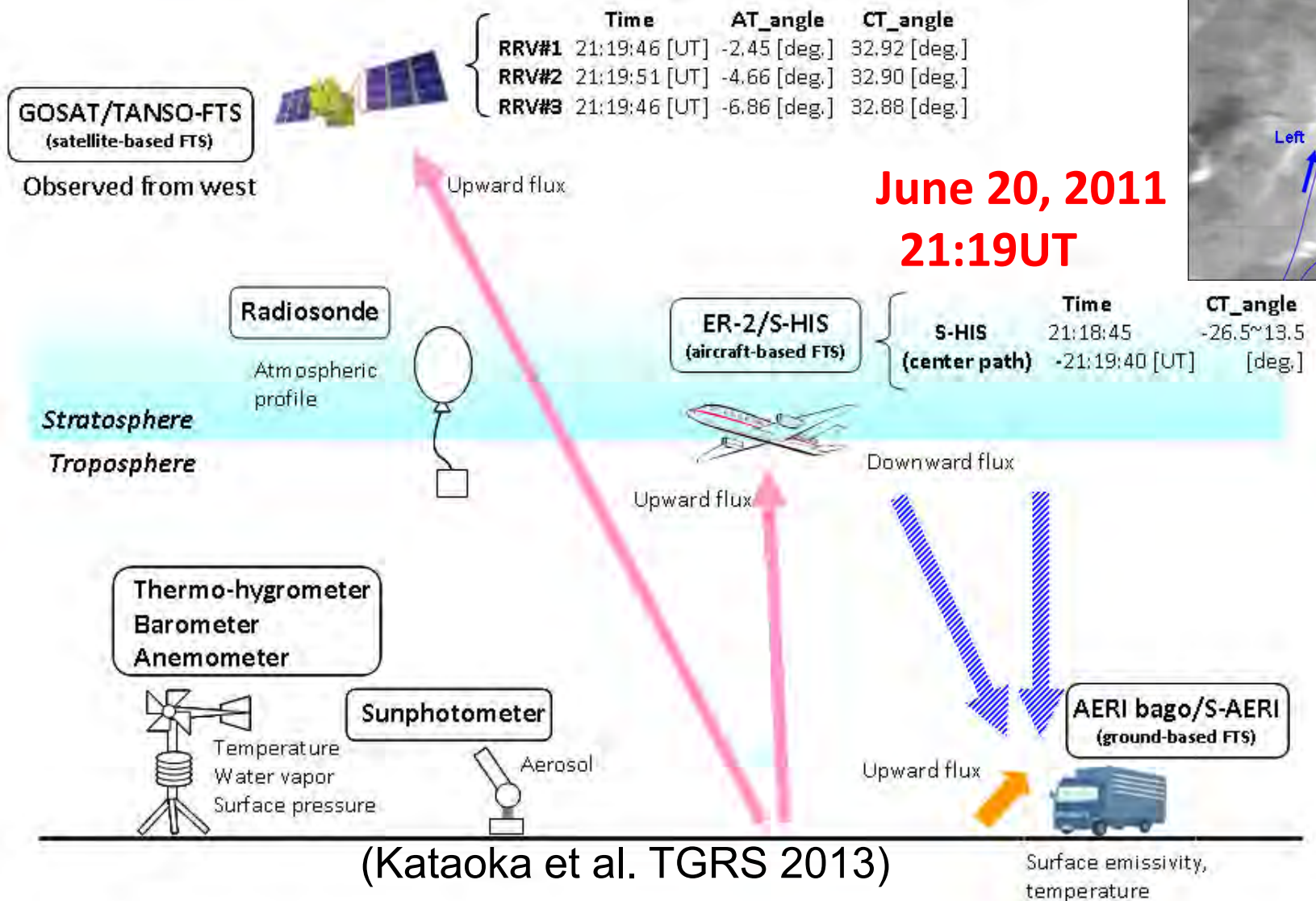
TANSO-CAI
(0.38, 0.67, 0.87, 1.6 μm)



- Radiometric Validation
- TIR

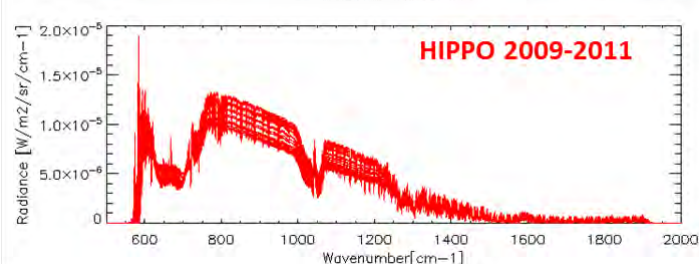
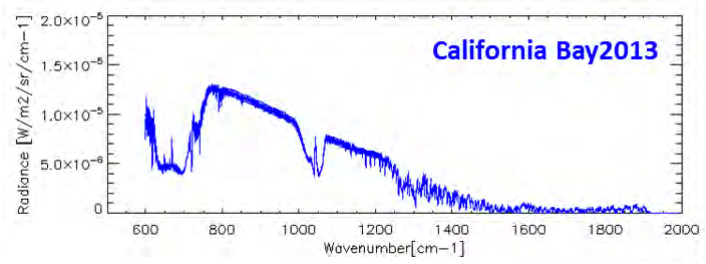
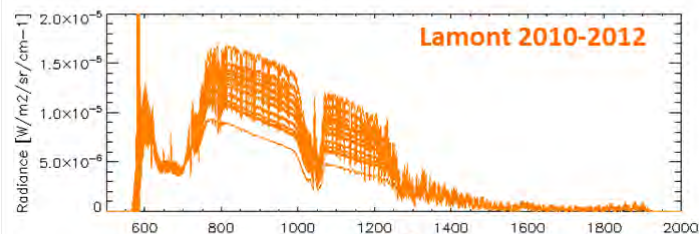
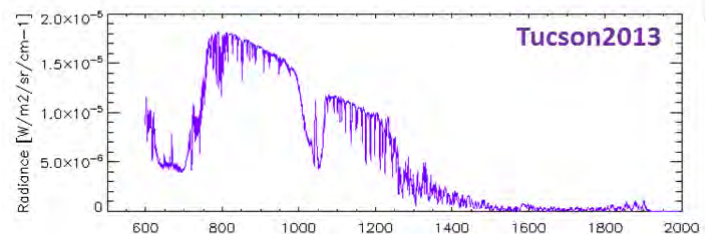
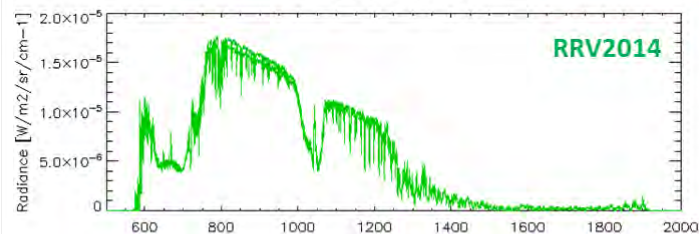
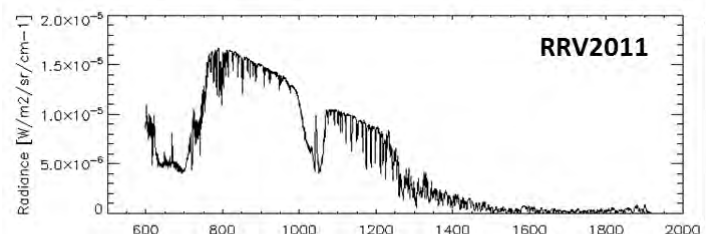
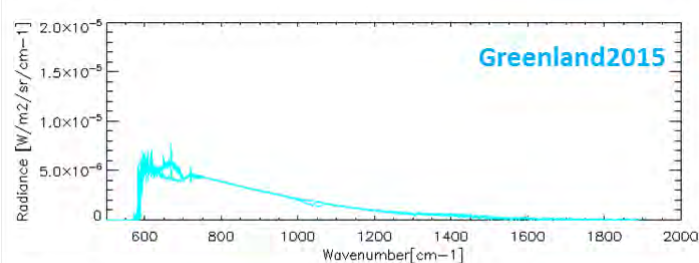
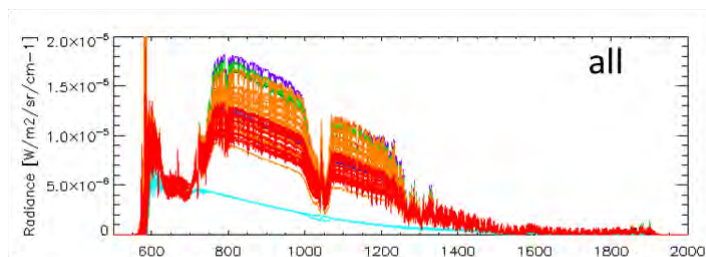


Various Calibration (TIR) Hot Land target over the land (high temperature)

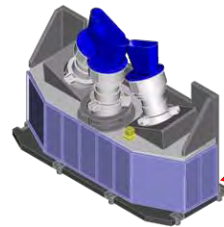




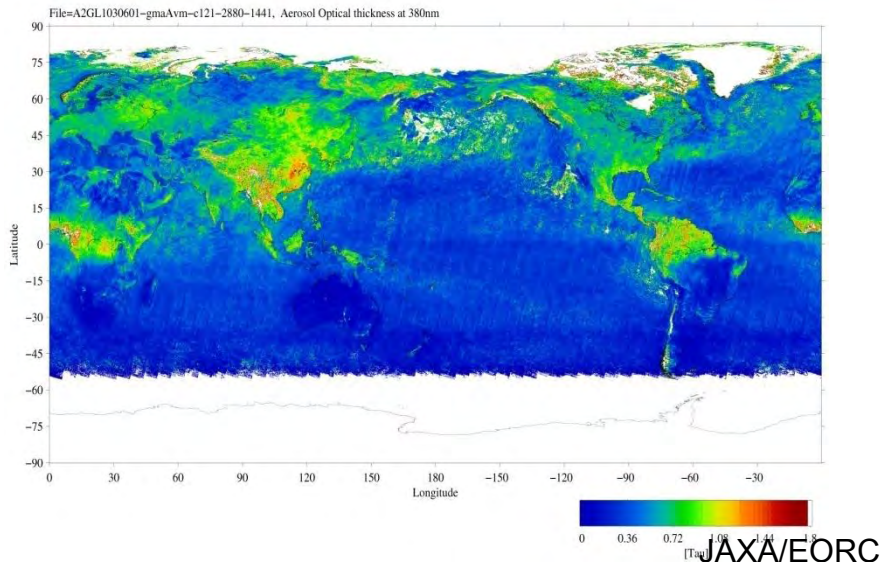
GOSAT data that are compared to Simulation with HIPPO and S-HIS data



SGLI VNR non-POL telescopes:
380, 412, 443, 490, 530,
565, 673, 763, 868nm



Aerosol estimated by Near-UV

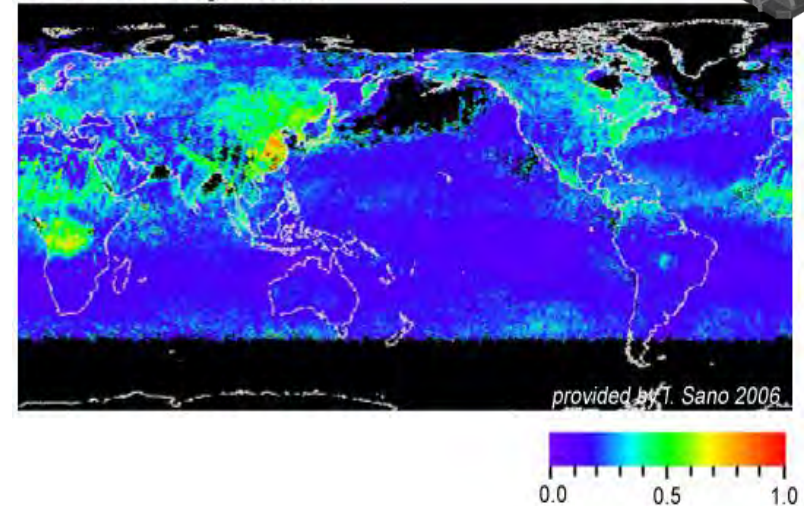


Global aerosol optical thickness in June 2003
using the GLI Near-UV (380nm) channel (NIR is
used for the ocean area)

SGLI VNR Polarization telescopes:
673 (pol: IQU), 868nm (IQU)

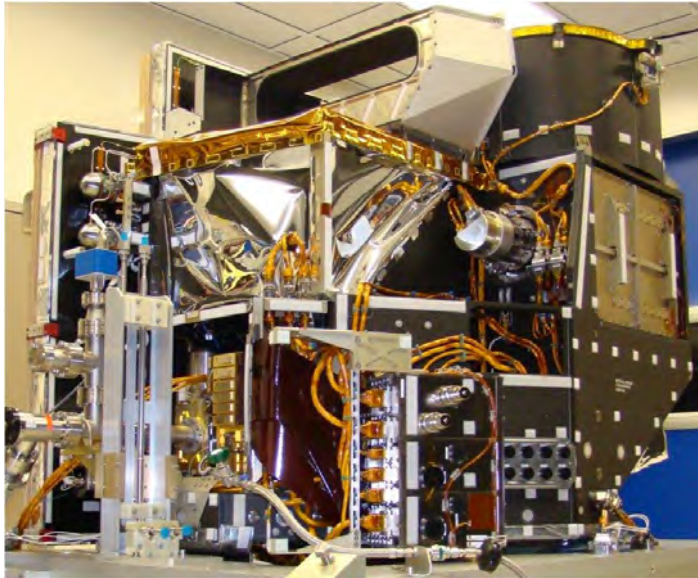
Aerosol estimated by polarization

AOT June 2003 using POLDER-2



Global aerosol optical thickness in June 2003
using POLDER-2 polarization reflectance
(provided by T. Sano, Kinki Univ.)

- Geostationary Weather Satellite
 - Himawari 8 and 9

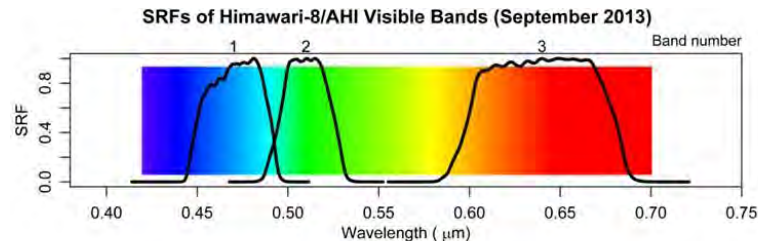


JAM

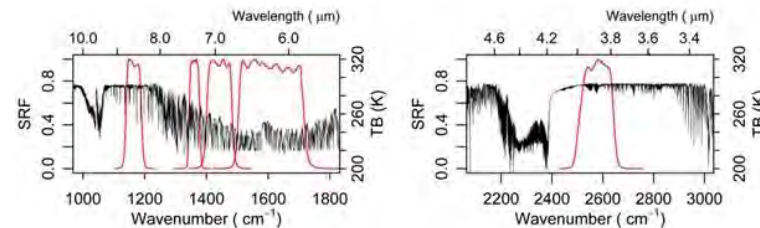
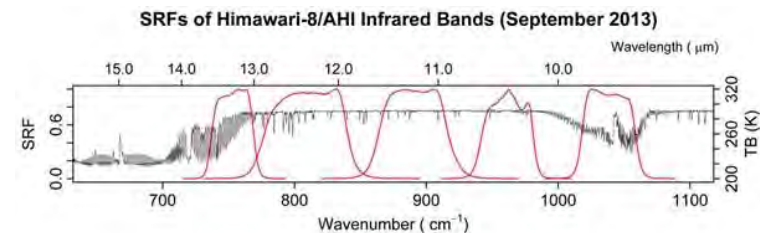
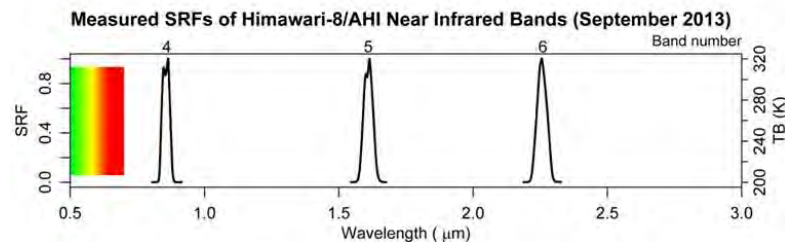
[JMA homepage](#)

Asia Air quality monitor

area	Band number (see Table 1)	Spatial resolution at SSP (sub satellite point)[km]	Numbers of pixels	
			East-west direction	North-south direction
Full Disk	3	0.5	22,000	22,000
	1,2,4	1	11,000	11,000
	5-16	2	5,500	5,500



RGB VALUES FOR VISIBLE WAVELENGTHS by Dan Bruton (<http://www.physics.sfasu.edu/astro/color/spectra.html>)





Asia Air quality monitor

High resolution (~2km) and frequent data for mega cities in Asia can be provided.
Aerosol thickness and size index.



JAXA Himawari Monitor

P-Tree System

日本語

Last Update: 07 Nov 2015 15:02:02 UTC

Date: 2015 / 10 / 9 10~19 UTC Search

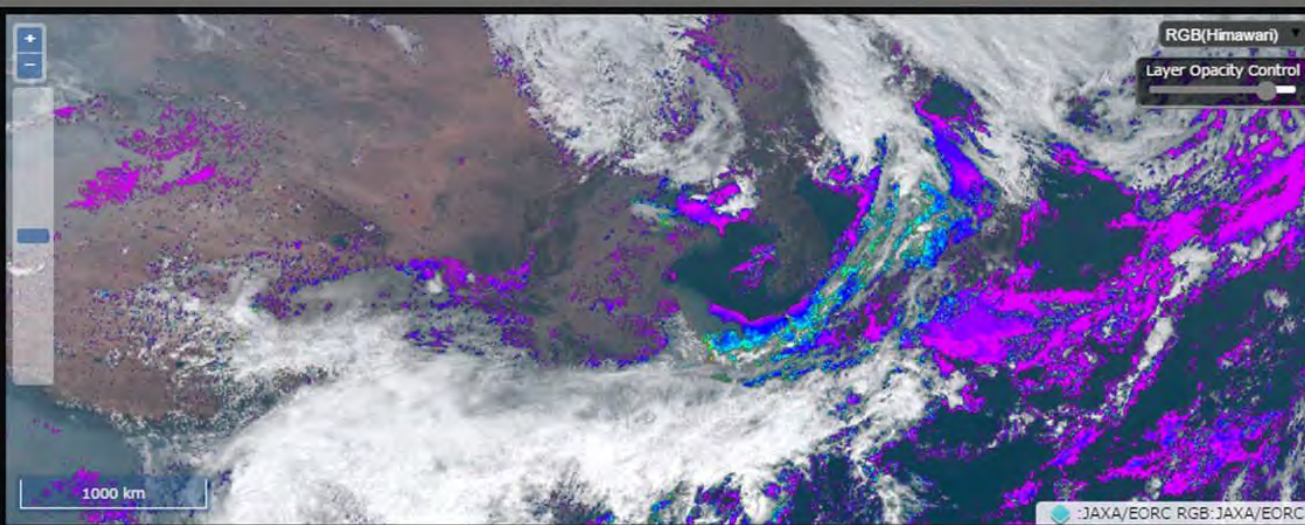
Prev

Latest Image

Next

10 min

1 Hour Ave./Integ.



AOT: 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

Overlay: Coastline Lat/Lon Major River

Sea Surface Temperature

Sea Surface Temp. (June-July)

Aerosol Optical Thickness

Aerosol Angstrom Exponent

Short Wave Radiation

RGB(Himawari)

Layer Opacity Control

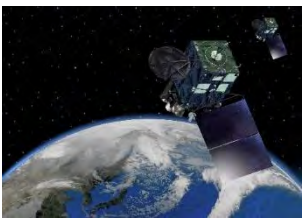
JAXA/EORC RGB: JAXA/EORC

<http://www.eorc.jaxa.jp/ptree/index.html>

Operation and weather forecast: Japan Meteorological Agency

Advanced data analysis (aerosol): JAXA Earth Observation Research Center

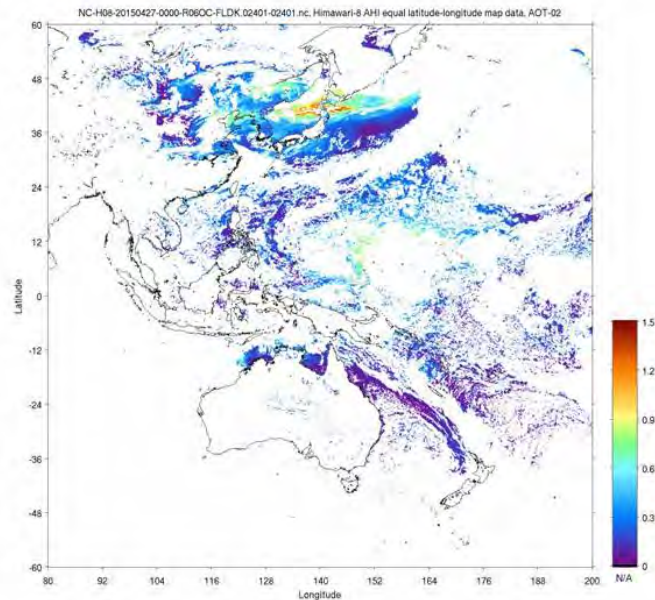
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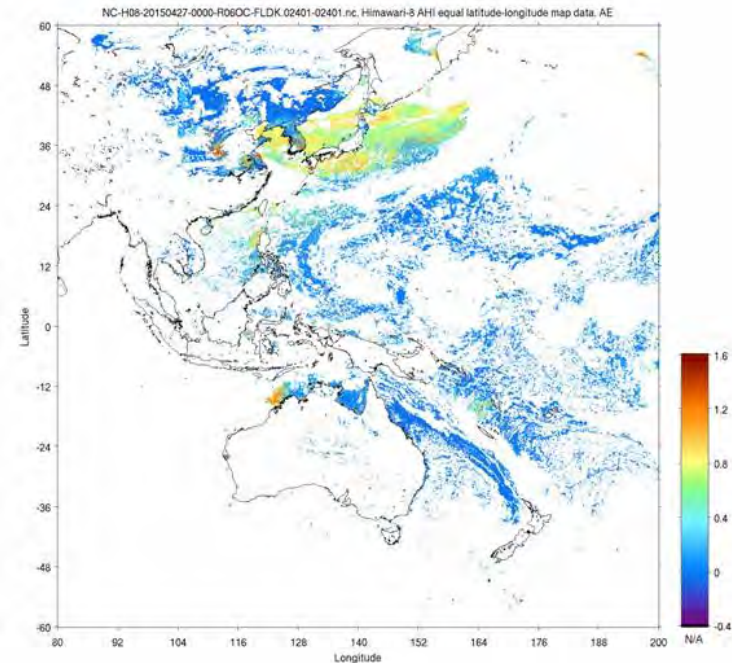
AHI Advance Himawari Imager
More frequent, more bands (5>16)
Much higher spatial resolution (1km)



Aerosol optical thickness



Himawari-8 Aerosols
Aerosol angstrom exponent

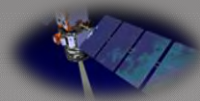
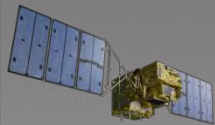


An example on 27 April 2015

Courtesy of Dr. Murakami

- Every 10 minutes, full disk
- Data available in a day

19
19



NEXT CEOS WGCV meeting

EOS WGCV-41 (Sep 7-9) Working Group on Calibration & Validation

CEOS SAR (Sep 5-7) SAR Calibration & Validation sub-group Workshop



The 100th Anniversary Hall at Senju Campus
Tokyo Denki Univ.

5 Senjyu-Asahicho, Adachi-ku, Tokyo 120-8551, Japan